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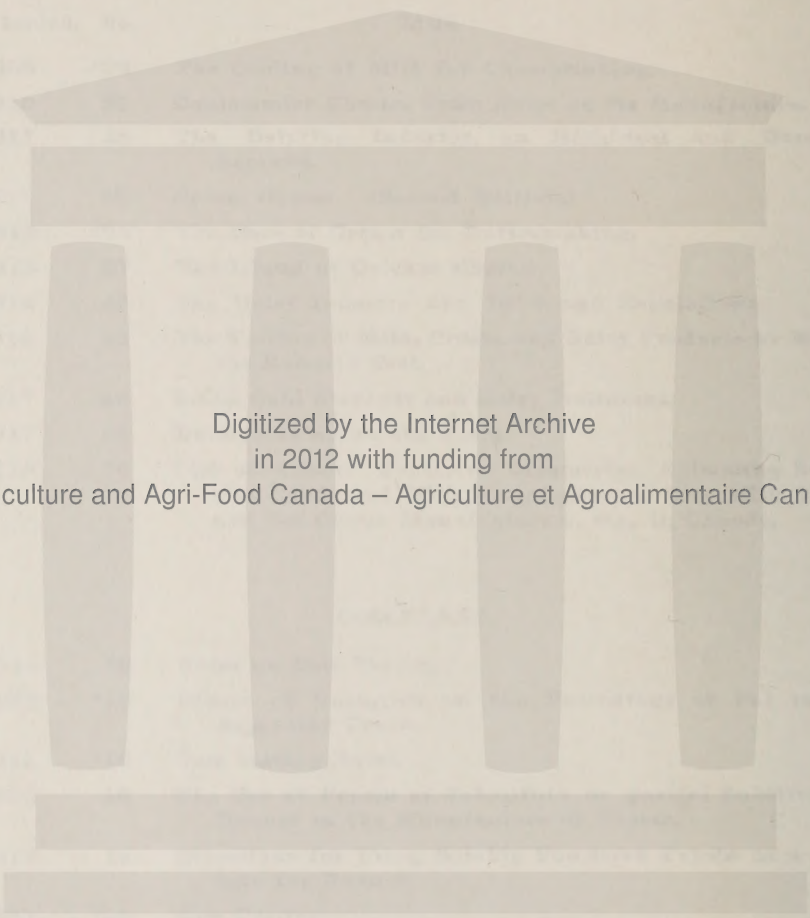

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DEPARTMENT OF AGRICULTURE

OFFICE OF THE DAIRY AND COLD STORAGE COMMISSIONER.

OTTAWA, April 2, 1919.

THE CARE OF CREAM FOR BUTTERMAKING.

(Revised and Condensed from Bulletin No. 32.)

By GEO. H. BARR,
Chief of the Dairy Division.

The manufacture of butter in creameries on what is known as the gathered cream plan has become quite general throughout Canada. The advantage of having fresh warm skim-milk for feeding purposes, the desire to avoid the risk of getting disease in their herds from the mixed skim-milk from a large number of farms, together with a lower cost of hauling and, in most cases, a lower cost for manufacturing the butter, makes the system popular with many milk producers.

Cream separated on the farm can be delivered to the creamery in as good condition as milk for separation if the patron who skims his milk at home takes proper care of the cream and delivers it to the creamery often enough.

It is admitted by all dairy authorities that finer butter can be made from cream which is sweet when delivered at the creamery than from cream which is sour and curdled. It is also well known that any taint that may be in the milk or cream will be to some extent carried into the butter.

In the production of fine flavoured cream, the same precautions must be observed as those which are necessary in furnishing milk to separator creameries or to cheese factories. The following are some of the essential points:—

Feeds that will injure the flavour of the butter, and which should not be fed to milch cows:—

1. Turnips and turnip tops.
2. Rape or rye.
3. Decayed ensilage.
4. Leeks, onions, or apples in large quantities.

Other causes of taints in cream:—

1. Cows' udders and teats in an unclean condition at milking time.
2. Milking in unclean stables.
3. Using unclean, wooden, galvanized or rusty milking pails.
4. Separating the milk in the stable.
5. Improperly cleaned separators.
6. Keeping the cream in cellars or other places where there are roots or vegetables.
7. Keeping the cream for several days at a temperature over 55 degrees.
8. Cows drinking water from stagnant pools, or the leakage from barnyards.

CONDITIONS THAT ARE NECESSARY TO PRODUCE FINE-FLAVOURED CREAM.

Pure Water.—The cows should have access to an abundant supply of pure water. When cows are compelled to drink the water of swamps, muddy ponds or sluggish streams and ditches, in which there is decaying animal matter, including their own droppings, there is a constant menace to their health, and unless the cows are in good health they cannot give first-class milk. Moreover the mud, often full of foul germs, which collects on the legs, flanks and udders of the cows and falls into the milk at the time of milking, is a direct source of infection.

Salt.—When cows have free access to salt they will keep in better health, will give more milk, and the cream from this milk will have a better flavour and keep sweet longer than cream from cows that do not get any salt at all, or receive it only at intervals.

Milking.—Cleanliness in the stable is desirable at all times, but especially at milking time should the stables be clean and free from dust. The udders, teats and flanks of the cow should be brushed before milking. Only bright, clean, tin pails should be used. Galvanized pails are difficult to keep clean, and bad flavours have been traced to their use.

THE HAND-POWER SEPARATOR.

The hand-power cream separator is the most reliable and best method of skimming milk at the farm, and the only method that can be recommended. Nearly all the separators on the market are efficient if properly handled.

Handling and Care of the Separator.—It is important that the separator should run smoothly. Any trembling or shaking of the separator while in operation will cause a loss of butterfat in the skim-milk. Only special separator oil should be used, except about once in three weeks when kerosene oil should be used on all the bearings for the purpose of cleaning.

In operating a separator three things should be observed: (1) Run the separator at the correct speed. A low speed means the loss of fat in the skim-milk. (2) The flow of the milk into the separator should be uniform. (3) The temperature of the milk should not be under 90 degrees, and for that reason the best time to separate the milk is immediately after milking. A low temperature is also liable to cause loss of fat in the skim-milk. The faster the milk passes through the separator, the less complete is the separation, and the thinner will be the cream. One of the questions often asked by patrons is: Why do my tests vary so? When one knows that the speed of the machine, the flow of the milk, and the temperature of the milk all affect the test of the cream, it is not difficult to understand why it may vary considerably. (See Circular No. 14.) A variation in the test does not necessarily mean any loss to the patron. Every separator has some device for changing the per cent of fat of the cream. In most cases the adjustment is at the cream outlet. If so, turning the cream screw *in* makes cream richer and turning it *out* has the opposite result.

All the parts of the separator which come in contact with the milk or cream should be washed in luke-warm water, to which has been added a small quantity of sal soda or other cleansing powder, and then thoroughly scalded with boiling water each time the separator is used.

Location of Separator.—In some cases the separator is placed in the stable. This may be a convenient arrangement, but it is not by any means a proper place for separating milk, unless a special room, well ventilated and lighted, is partitioned off to exclude the stable odours and dust. This room should have a smooth cement floor, which can be easily cleaned.

Advantages of a Rich Cream.—Thin cream is responsible to a large extent for the old sour cream flavour so frequently found in gathered cream butter.

Many patrons have the idea that a large amount of cream should return a correspondingly large pay cheque, forgetting that they are paid only for the butterfat in the cream, or the butter made from the fat.

The skimming of a rich cream is a decided advantage to the patrons in more ways than one. The following table shows the advantage with reference to hauling and the amount of skim-milk retained on the farm, of skimming a rich cream with a herd of ten cows with an average yield of 4,000 pounds of milk testing 3·5 per cent.

TABLE I.—Total milk, 40,000 pounds. Total butter fat, 1,400 pounds.

——	Sent to the Creamery.		Kept on the Farm.	
Per cent fat in cream.	Butter-fat.	Cream.	Skim-milk.	Skim-milk.
	Lb.	Lb.	Lb.	Extra Lb.
20.	1,400	7,000	33,000	.....
25.	1,400	5,600	34,400	1,400
30.	1,400	4,662	35,338	2,338
35.	1,400	4,004	35,996	2,996
40.	1,400	3,500	36,500	3,500

The foregoing table shows that there is the same amount of fat sent to the creamery in all cases, but there is a very great difference in the amount of skim-milk left on the farm. An additional advantage is that there is less cream to be taken care of, and it is easier to keep it sweet.

Table II shows the results of experiments conducted by the Dairy Division, on keeping thick and thin cream from the same milk under exactly the same conditions for different periods.

TABLE II.

Cream Kept.	Length of time kept.	Fat in cream.	Temperature of cream.	Acidity of cream.
		Per cent.	Degrees F.	Per cent.
In the cellars	36 hours	31·00	65·50	0·430
In the cellars	36 "	22·20	66·50	0·540
In insulated tanks	36 "	31·67	57·50	0·175
In insulated tanks	36 "	22·00	57·50	0·195
In insulated tanks	60 "	32·19	55·40	0·380
In insulated tanks	60 "	21·55	55·50	0·440

These figures show that in every case the thin cream had the highest acidity, and it had always a much stronger flavour.

If all the cream sent to cream-gathering creameries tested 30 per cent fat, it would mean thousands of dollars of extra money in the pockets of the patrons from the feeding of more and better stock, and the quality of the butter would be very much improved.

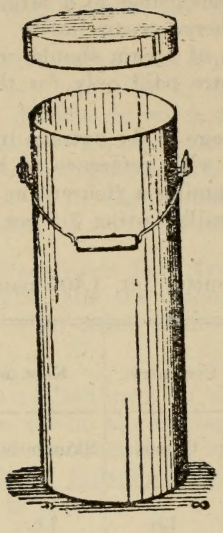

FIG. 1.

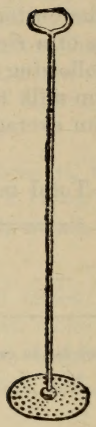

FIG 2.

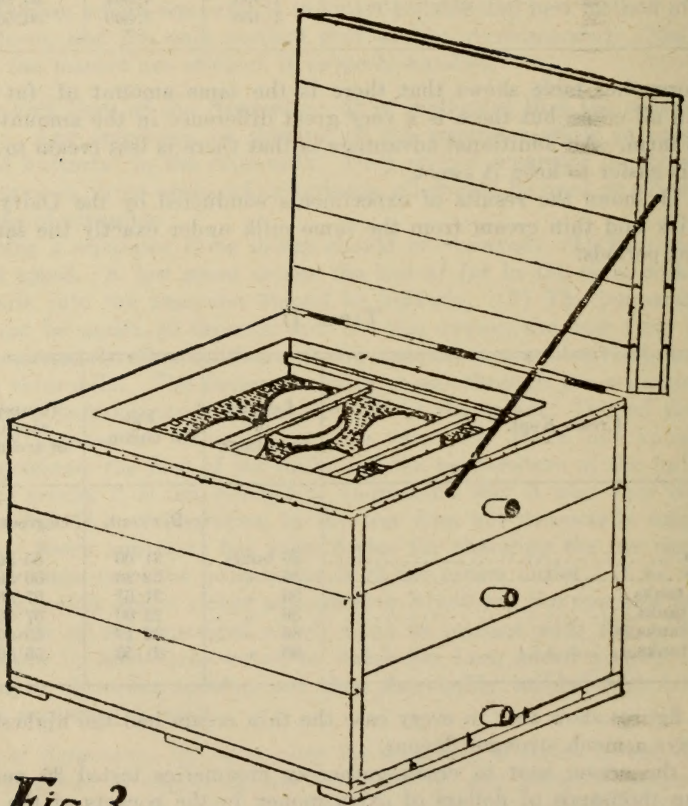

FIG. 3

Vessels for Holding Cream.—Many patrons keep the cream in earthen crocks, or in open pails. Crocks are liable to get broken or chipped, and experiments conducted at the Ontario Agricultural College Dairy School, Guelph, show that earthen crocks if chipped in any way cause an undesirable flavour in the butter. Cream exposed in open pails is apt to become tainted. A well soldered, plain bottomed tin can about 8 inches in diameter and 20 inches deep is the best vessel in which to hold cream. This style of can (Fig. 1) is easily cleaned and convenient to handle. When two lots of cream are mixed, the mixture should be well stirred. Fig. 2 shows a very useful utensil for this purpose.

WHERE TO KEEP THE CREAM.

Keeping Cream in Cellars.—Much of the cream sent to creameries is kept in cellars. Our own experiments proved that we could not keep cream sweet for thirty-six hours, or for delivery every other day, in cellars which were as cool as the ordinary run of farm-house cellars; also that the cream when left uncovered developed a strong cellar flavour and the butter had a tendency to become rancid.

The following table shows the temperature, and acidity by the acidimeter test, of cream kept in the cellars for different periods.

TABLE III.

Length of time kept.	Average temperature of cellars.	Average temperature of cream.	Average acidity of cream.
	Degrees F.	Degrees F.	Per cent.
36 hours	63·7	64·5	0·47
60 "	62·9	63·5	0·50
72 "	64·0	64·0	0·52

NOTE.—Freshly separated cream will show, according to the acidimeter test, about 0·13 per cent of acid; the acidity continues to increase more or less rapidly according to the temperature. When the acidity reaches 0·25 per cent, it begins to be perceptible to the taste, and the cream is then said to be "sour." The change is a gradual one, and the difference between what we call "sweet" cream and "sour" cream is one of degree only. The human sense of taste is not as delicate as the acidimeter test and cannot detect the same differences. When the cream reaches the stage of thickening, it has an acidity of about 0·35 per cent.

Keeping Cream in Iced Water.—We have found that the easiest and best way to keep cream sweet and clean in flavour is to put it in a shotgun can (Fig. 1) and place it in a tank of iced water dimmediately after skimming. We can recommend the insulated tank as shown in Fig. 3. This tank is made with a space of four inches on all sides and on the bottom which is filled with planing-mill shavings, the cover also being insulated in the same manner. It is lined inside with galvanized iron. Such a tank is a little expensive, but it is certainly a great saver of ice. An ordinary wooden tank is next best. All tanks should have covers, as they help to keep down the temperature of the water and cream.

Table IV shows the advantage of keeping cream in an insulated tank with water to which ice was added, compared with the best results obtained when kept in a cellar. The cream was divided into two lots immediately after skimming, one lot set in the cellar and the other set in ice-water.

TABLE IV.

Treatment given the cream.	Length of time kept.	Average temperature of cream.	Average acidity of cream.
		Degrees F.	Per cent.
Cooled in tank	36 hours	52·8	0 157
Set in cellar	36 "	64·5	0·470
Cooled in tank	60 "	53·0	0·165
Set in cellar	60 "	63·7	0·505

These results show that the cream from the cellar had three times as much acid as that cooled in iced water.

Keeping Cream in a Refrigerator.—Some people have recommended cooling the cream by placing it in a refrigerator immediately after skimming.

The following table shows the results of dividing cream equally into two lots, cooling one lot in iced water and the other in a first-class household refrigerator.

TABLE V.

Cream kept in.	Average temperature of cream.	Average acidity of cream.	Ice used.
	Degrees F.	Per cent.	Lb.
Refrigerator	53·9	0·415	221
Ice water	54·8	0·230	178

There was more ice used in the refrigerator than in the water. The average minimum temperature of the different lots of cream kept in the refrigerator was nearly one degree lower than the average minimum of those cooled in water, yet the acidity was almost twice as high. This was no doubt due to the fact that the iced water cooled the cream much faster than the cold air of the refrigerator. Water is a much better conductor than air.

The covers were kept on the cream cans in both cases and there was practically no difference in the flavour of the cream at any time.

Both lots of butter scored 42·5 points for flavour when fresh. When three weeks old, the butter from the cream cooled in iced water scored 40·77 points and the other 39·88 points.

Table VI shows the effect of different temperatures on the acidity of cream kept for different periods.

TABLE VI.

Length of time kept.	Average temperature of cream.	Average acidity of cream.
	Degrees F.	Per cent.
36 hours	50·6	0·145
36 "	55·0	0·170
36 "	57·5	0·190
36 "	58·5	0·210
36 "	64·0	0·510
60 "	53·0	0·150
60 "	55·5	0·310
72 "	58·7	0·380
84 "	47·5	0·165
84 "	54·0	0·390

It will be observed that when the cream was cooled to 55 degrees F. soon after skimming, it remained sweet to the taste for thirty-six hours, or long enough for delivery to the creamery in that condition. A temperature of 55 degrees F. can be secured at most farms with ordinary well water if an insulated tank is used. If this temperature cannot be secured with water alone, ice should be used.

To keep cream sweet for eighty-four hours, or for delivery twice a week, its temperature must be kept down to 48 degrees F. To get this result ice must be used. The lot of cream kept eighty-four hours at 54 degrees F. was cooled in an insulated tank with water from the well at 48 degrees F., changed night and morning. It was quite sour when delivered to the creamery.

We were able to keep cream perfectly sweet for eighty-four hours, but the flavour was not clean. Keeping the cream for longer periods than two days at the farm has, no doubt, much to do with the old cream flavour so common in gathered cream butter.

THE CREAMERY OWNER'S RESPONSIBILITY.

While asking the patrons to make improvement in their methods, we do not wish to relieve the creamery owners and managers of their responsibilities to the patrons. They must see to it that the equipment of the creamery is such that the cream supplied is handled in the most efficient way; that the testing is done accurately and honestly, and that the creamery is a model of cleanliness and a standing object lesson for the patrons.

These conditions cannot be secured or maintained unless there is a reasonable price paid for manufacturing. Modern creamery equipment is expensive, and it is an unwise policy on the part of the producers of cream to insist on such low prices for manufacturing that the creamerymen cannot afford to equip the creamery with modern appliances or to collect the cream at least three times a week. Cheap creamery equipment and cheap buttermakers may be very expensive in the end to cream producers. Both creamerymen and patrons should remember that a reputation for finest goods will ensure the highest current price and often a premium in addition. This enviable position can only be reached by every one doing his or her best and by having the closest co-operation and harmony in all the work relating to the creamery and the farm.

A sufficient number of copies of this circular, to give one to each patron, will be sent to any creamery on application to the Publications Branch, Department of Agriculture, Ottawa, or to the Dairy Commissioner, Ottawa.

Circular No. 14, "Causes of variation in the percentage of fat in hand separator cream," and circular No. 25, "Keeping Dairy Herd Records," are also available for distribution among patrons of creameries.

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